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Project Number 6884

Mr. James Shafer
Remedial Project Manager
Northern Division, Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order No. 0254

Subject: Preliminary Response to Comments, Draft Marine Ecological Risk Assessment Report
Former Derecktor Shipyard, Naval Education & Training Center, Newport Rhode Island

Dear Mr Shafer:

Enclosed are two copies of preliminary responses to comments received from the U.S. EPA on the report referenced above. The comments were received on September 30, 1996. This material has been forwarded to Kymberlee Keckler of the EPA in order to facilitate discussions at the ninth meeting of the Ecorisk Advisory Board (EAB), scheduled for October 16, 1996. These responses will be finalized following that meeting, and a formal distribution will then be made.

As you know, there were no outstanding comments from NOAA, and comments from the Rhode Island Department of Environmental Management were received on October 8, 1996. We are reviewing these comments and will be prepared to discuss them at the EAB meeting on October 16, 1996.

If you have any questions regarding this submittal, please do not hesitate to contact me.

Very truly yours,

Stephen S. Parker
Project Manager

SSP/gmd

Enclosures

c: B. Wheeler, NETC Newport (w/enc.)
K. Keckler, USEPA (w/enc. - 2)
J. Trepanowski/M. Turco, B&R Environmental (w/enc.)
File 6884-3.2 (w/o enc.)/6884-8.0 (w/enc.)

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EPA Comments as per letter dated August 29, 1996 from Kymberlee Keckler (EPA) to James Shafer (Department of the Navy), regarding "Derecktor Shipyard Marine Ecological Risk Assessment Report".

General Comment. *Several issues that EPA raised at the July 18, 1996 Ecological Advisory Board ("EAB") meeting about methods of "synthesizing risks" need to be resolved in the revised draft document. Detailed comments are provided in Attachment A.*

General Response. Itemized issues concerning changes and/or additions to the revised draft are addresses separately below, with specific responses provided for each comment.

Comment 1. *[p. 1-9, §1.4.2, ¶1] The statement that "silver was not detected in residues from any station" is not supported by the data presented in Appendices A-1-6.2 and 1-6.3. Delete this statement.*

Response 1. This statement is correct in that silver was not detected in indigenous blue mussel tissue residues from any station (see Appendix A-1-3). Appendices A-1-6.2 and A-1-6.3 present Hazard Quotients for avian predators feeding on species from the study area. For conservative purpose, one-half the detection limit was used for calculations where the CoC in question was not detected.

Comment 2. *[p. 1-28, §1.6, ¶1] Refer to the minutes from the EAB that discuss setting categories of risk. Use of definitions/methods from Suter et al. (1995) were rejected by EPA at this meeting (see also p. 1-29, §1.6, ¶3).*

Response 2. The revised risk assessment categories will not use Suter's quantitative ranking evaluations. It is the Navy's opinion, however, that some definition of the new risk categories be provided in the introductory material. The following definitions are proposed:

"*Baseline* risk is defined as the probability of adverse ecological effects equivalent to that from contamination and other environmental conditions associated with the site."
not

Low probability of ecological risks suggests possible, but minimal impacts based on some of the exposure or effects-based weights of evidence, while impacts are undetectable by the majority of exposure and effects-based weights of evidence. Low probability of risk typically lacks demonstrable exposure-response relationships.

Intermediate probability of ecological risk falls between high and low probabilities of risk. The intermediate risk probability is typically associated with multiple exposure or effects weights of evidence, suggesting that measurable exposure ~~and/~~or effects are occurring at the site, but not both, and typically, quantitative exposure-response relationships are lacking. Intermediate risk probability may also be indicated if the spatial extent of apparent impact is highly localized (e.g., a single station) or the impact may occur for periods of very limited duration.

"*High* probability of ecological risk is that suggested by numerous weights of evidence which indicate pronounced contaminant exposure and effects, as well as demonstrable exposure-response relationships. High probability of risk may also exist if the spatial extent of apparent impact is great, or the impact is likely to be persistent over long periods of time.

Comment 3A. *[p. 1-29, §1.6, ¶3] Support the statements, "...apparent localized hypoxia appears to explain this condition [of effects on benthic community structure]..." and "...restricted water circulation and nutrients...," with conclusions from specific data. For example, data from Stations DSY-40 and 41 concerning dissolved oxygen (8.37 mg/L D.O.), and unionized ammonia (0.001 mg/L) do not support the conclusions of hypoxia or restricted circulation. In addition, near-bottom velocity maxima illustrated in Figure 4.2-11 and near-bottom deposition/erosion in Figure 4.2-12 do not support these conclusions either. Recheck the results of the data and revise the conclusions accordingly.*

Response 3A. The Navy stands by its conclusion that hypoxia may be the primary cause of altered benthic community structure within the DSY-40/41 enclosure. Specific data supporting the conclusion of hypoxic impacts will be brought forward from sections 4 through 6 of the report into the executive summary to support this conclusion. Lines of evidence include:

- Statistical analyses showing change in benthic structure related to the redox-potential discontinuity (RPD) depth (i.e., the depth of the oxygenated layer), but not for the the other parameters (Figure 6.5-1D);

exchange ?

- Restricted ~~circulation~~ within the DSY-40/41 enclosure for non tidal currents (Section 4.2);

- Correlation between fecal pollution indicators (as a correlate of sewage-related nutrient input) and tissue chemistry in deployed mussels;

- Lack of alternate hypotheses (e.g. low sediment HQ, low or absent toxicity).

It is agreed that the measured DO, pH and ammonia do not appear to support hypoxia, however the data collection did not take place at the period of time when hypoxia impacts measurable in the water column would be expected to occur. Rather, the data were used to calibrate a model of dissolved oxygen dynamics on a harbor wide basis. The model resolution is not sufficient to specifically address localized areas such as the DSY-40/41 enclosure. It is apparent from the shallow RPD in the sediments that relatively higher organic loading is occurring in this zone than elsewhere; also, at times of peak water temperature, the RPD may potentially reach the sediment-water interface. The near-bottom deposition/erosion data (Figure 4.2-12) supports this hypothesis in that much of the enclosure area would permit deposition to occur. The near-bottom velocity maxima data (Figure 4.2-11) is high, but field observations suggest that the current is circular and would tend to retain particulates. Hence, the available data do support the conclusion of potential hypoxia in the DSY-40/41 enclosure. Additional discussion of the above logic will be developed to better support the conclusions of risk for this location.

Comment 3B. *The method of categorizing risks used in the risk assessment is questionable because Station DSY-41 is identified as a "slight risk station," but life was absent from the benthos, and this is the same risk category assigned to the reference stations.*

Response 3B. Ecological risks for this ERA are categorized on the basis of probability that shipyard-related CoCs are adversely impacting target species. Concordance of exposure-based and effects-based weights of evidence are used as the primary information for scaling of risks. By definition, the reference site is not impacted by shipyard-related activities. The risk ranking of the reference location is performed only as a qualitative point of comparison. However, the assessment of the benthic community for the weights of evidence potentially impacted by the site does rely upon comparisons with reference stations, but also relies on existence of CoC-exposure relationships. The fact that benthic populations differ between DSY-41 and the reference site is not in itself direct evidence of CoC-related risk; since the explanation of the difference may be that the reference site and the enclosure are not comparable environments, given that the reference areas are open coastal habitats. In addition, CoC-exposure relationships must also be examined, as such data were key to the interpretation of risks at Station DSY-41.

Comment 3C. *Define how the evidence was weighted in the assessment (e.g., less weight given to field survey data versus more weight to chemistry or toxicity data) (see also p. 1-28, §1.6, ¶1).*

Response 3C. The evaluation of risks is based upon preponderance of the data; where a greater number of endpoints suggest adverse risks, it is presumed that a greater probability of adverse risk exists. No priority or weight is given to any particular endpoint. Definitions for each of the risk categories are provided in Response 2, above.

Comment 4. *[p. 2-1, §2.0, ¶2] Define abbreviations for University of Rhode Island (URI) and Science Applications International Corporation (SAIC).*

Response 4. The appropriate abbreviations will be added to the text.

Comment 5A. *[p. 2-2, §2.0, ¶2] Add "potential for bioaccumulation of chemicals and food chain exposure modeling" to the list of components to be considered in the risk assessment.*

Response 5A. The recommended text will be added.

Comment 5B.	*After identifying the components (e.g., direct field observations, chemical data, etc.) of the weight of evidence, edit the text by adding specific language concerning any "priority" or "weight" that may have been given to one of these components in characterizing risks as "slight," "moderate," etc. in the risk summary (see also p.1-28, §1.6, ¶1 and p. 1-29, §1.6, ¶3).*
Response 5B.	The recommended text will be added to indicate that the evaluation of risks is based upon preponderance of the data; where a greater number of endpoints suggest adverse risks, it is presumed that a greater probability of adverse risk exists. No priority or weight is given to any particular endpoint.
Comment 5C.	*Define how weights of evidence will be assembled to summarize risks, to the item "4" text on page 2-4 regarding risk communication in support of risk management decisions.*
Response 5C.	The recommended text will be added to indicate that results of weights of evidence will be assembled into a summary risk table to communicate risks in support of risk management decisions.
Comment 6.	*[p. 2-5, §2.2, ¶2] Revise the third bullet by replacing inappropriate use of "endemic" with the more accurate "marine and semi-aquatic," and adding "food chain exposure modeling" to the list of items ending with "benthic community structure."*
Response 6.	The recommended edits will be made.
Comment 7.	*[pp. 4-5 to 4-18, §4.2] Discuss how these studies synthesize the complimentary data. Do the different methods of characterizing the cove (presented in these sections) result in characterizations that are consistent with the currents, velocity, erosion/deposition, dissolved oxygen content, etc. in the cove? It is not clear in this draft document whether differences in the data, identified during the last EAB meeting (e.g., substantial disagreement in characterizations of the cove based on hydrographic versus geotechnical data) are resolved. Zones of deposition/erosion still seem to conflict by method of field measurement, and combined with the dissolved oxygen data, do not support conclusions of the risk assessment (see also p. 1-29, §1.6, ¶3 and p. 1-28, §1.6, ¶1).*

Hydrographic survey results show potential for deposition based on tidal & non-tidal currents. Other factors not evaluated.

Response 7. Text will be developed to synthesize the hydrological, geophysical and modeling data for the cove so as to better support the conclusions of the risk assessment.

The sidescan shows surface sed. (grain size) ? They don't necessarily have to agree.

Comment 8a. *[p. 4-17, §4.2.4, ¶¶1&2] Conduct a quality assurance check of the dissolved oxygen ("DO") data predictions using the WASP5 model. Discuss in Section 4.4 the uncertainty associated with the use of this simulation data.*

of the draft report

Response 8a. The uncertainties associated with the application of the WASP model to Coddington Cove were clearly addressed, quantified, and evaluated in the study (see Section 4.2). Available techniques for quantifying uncertainties in modeling studies include sensitivity analysis, first-order analysis, Monte Carlo simulation, and Kalman filtering. SAIC used sensitivity analysis to quantify the uncertainties associated with the WASP application. Sensitivity analysis is the most commonly used technique in water quality modeling (USEPA 1995). The other techniques require considerable resources and/or observed data and are beyond the scope of this study. In addition, sensitivity analysis provides insight into the need for additional data.

Report should state uncertainties limitations w/ each study

Sensitivity analysis is used to assess the impact of uncertainty from one or more model variables on the estimate of simulated output variables. For the DO simulations at Coddington Cove, SOD and temperature are the main (uncertain) variables that might cause the dissolved oxygen to reach low concentrations that will adversely impact the aquatic organisms. Sensitivity analysis was performed on these variables to quantify the uncertainties associated with the model results. The analysis indicates that the DO level at Coddington Cove is highly unlikely to reach the critical levels.

Comment 8b. *The simulation data presented in this section and illustrated in Figures 4.2-13 and 4.2-14 do not compare with the relationships described by U. S. Fish and Wildlife Service (USFWS, 1982) among water temperature, DO, and % saturation of the water. Using rough estimates of the measured data for water temperature (14°C) and DO (7.6 mg/L) for 10/28/95 in the tables, approximately 105% saturation of seawater would have to been present. Therefore, in the simulation, a water temperature of 26°C (in Figure 4.2-13 - not worst-case) is accompanied by 7.1 mg/L DO (Figure*

4.2-14), and would require 125% saturation of seawater. It is questionable whether this % saturation by DO could be accomplished in a natural marine system, and raises concern over the model's predictive ability. If 105% saturation occurred at 26°C, DO would approximate 6 mg/L and not 7.2 mg/L DO which is reported in Figure 4.2-14. This discrepancy could be greater under the worst-case condition of 30°C in Figure 4.2-16.

Response 8b. The Navy disagrees with the above statement. In fact, for a water temperature of 26°C accompanied with a 7.1 mg/l dissolved oxygen in a 34 ppt (part per thousand) salinity would require a 106% saturation of seawater and not a 125% saturation, as indicated by the reviewer. The dissolved oxygen saturation is determined in the WASP model using the American Public Health Association relationship (APHA 1985). It relates the DO saturation at sea level as a function of temperature and salinity and is the most extensively used relationship in water quality modeling (Thomann and Mueller 1985, USEPA 1985a, USEPA 1985b).

The notable difference between the percent saturation claimed by the reviewer (125%) and the one computed in the simulation (106%) can be attributed to a different method used to compute the DO saturation. In 1985 the USEPA compared and evaluated five different techniques for the estimation of the DO saturation in a marine environment. The results of the comparison of the five methods for seawater of 36.1 ppt salinity are presented below for a temperature of 26°C (USEPA 1985b).

Table 1:

COMPARISON OF DISSOLVED OXYGEN SATURATION VALUES FROM SELECTED METHODS AT A SALINITY OF 36.1 ppt AND 1 ATM PRESSURE					
Temperature	**Genet et. al., 1974**	**Weiss, 1970**	**Hyer et. al., 1971**	**APHA 1971**	**APHA 1985**
26°C	6.676	6.594	6.912	6.6	6.616

Table 1 clearly indicates that the 125% DO saturation suggested by the reviewer is unsupported by the most common approaches referenced in Table 1. The five methods give a DO saturation at 26°C and 36.1 ppt salinity ranging from 6.594 to 6.912 mg/l. This corresponds to a 102.7% to 107.6% saturation of seawater. After review of the five methods, the USEPA concluded that the APHA

(1985) equation is based on the latest research and provides the most accurate values of the DO saturation to date. The discrepancy in DO saturation may be attributed to the salinity concentration used by the reviewer to compute the DO saturation. A 125% saturation at 26°C accompanied by a 7.1 mg/l DO would require a dissolved oxygen saturation of 5.68 mg/l. This DO saturation level at 26°C can only be reached in a "marine environment" having a salinity higher than 60 ppt which is unlikely to occur in Coddington Cove.

Refs :

APHA (American Public Health Association). 1971. Standards Methods for the Examination of Water and Wastewater, 14th Edition, APHA Washington, D.C.

APHA (American Public Health Association). 1985. Standards Methods for the Examination of Water and Wastewater, 16th Edition, APHA Washington, D.C.

Genet, L.A., D.J. Smith and M.B. Sonnen. 1974. Computer Program Documentation for the Dynamic Estuary Model, prepared for the U.S. Environmental Protection Agency, Systems Development Branch, Washington, D.C.

Hyer, P.V., C.S. Fang, E.P. Ruzecki, and W.J. Hargis. 1971. Hydrography and Hydrodynamics of Virginia Estuaries, Studies of the distribution of Salinity and Dissolved Oxygen in the Upper York System, Virginia Institute of Marine Sciences, Gloucester Point, Virginia.

USEPA 1985a. Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling (Second Edition). U.S. Environmental Protection Agency, Environmental Research Laboratory, Athens, Georgia. EPA/6003-85/040.

USEPA 1985b. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Groundwater - Part 1. U.S. Environmental Protection Agency, Environmental Research Laboratory, Athens, Georgia. EPA/600/6-85/002a.

Thomann R.V. and J.A Mueller. 1987. Principles of Surface Water Quality Modeling and Control. Harper and Row Publishers.

Weiss, R.F. 1970. The solubility of Nitrogen, Oxygen, and Argon in Water and Sea Water. Deep-Sea Research, 17:721-735.

Comment 9. *[p. 4-18, §4.2.4, ¶1] If the concerns raised above are correct, reduce the "threshold of 6 mg/L during critical summer months" (a worst-case estimate); or if there is sufficient uncertainty regarding this "threshold" estimate, qualify related statements in the report (edit the text elsewhere accordingly and revise analyses/ conclusions that depend on the simulation estimates).*

Response 9. See Response 8.

Comment 10. *[p. 5-15, §5.1] Add effects on ecological receptors evaluated in this risk assessment to the discussion of effects concerning the COCs. Although discussion of toxic effects on humans is helpful, this section of the report must include effects on ecological receptors. In other words, the discussion of toxic effects of PAHs in relation to human health effects (top of page 5-15) should be replaced with relevant data on ecological receptor effects. Metabolism of PAHs is more common among vertebrates than invertebrates. It is appropriate to discuss the bioaccumulation potential of PAHs by invertebrates (that do not readily metabolize PAHs) and the food chain transfer potential of PAHs to receptors, such as gulls or herons.*

Response 10. Approximately 5 pages of text discussing toxic effects of PAHs on ecological receptors are provided in the report (pp 5-15 to 5-20). Each CoC discussed focuses predominantly on ecological effects, not human health. However, in the referenced section, it is apparent that discussion of mammalian effects in the same paragraph as invertebrate effects is confusing and will be revised. The requested information on bioaccumulation and metabolism will be added.

Comment 11. *[pp. 6-7 to 6-10, §6.2.1] Edit the introduction to this section, and improve the clarity of the discussions in this section, to highlight the relevance of these comparisons for developing a measure of relative risk.*

Response 11. Text will be added to expand upon the utility of tissue residue data as a measure of both exposure and potential effects on target species.

Comment 12. *[p. 6-12, §6.2.2.2, ¶2] Revise the statements about the relevance of using a narcosis model of toxic action in the assessment. Based on the site tissue residue data in Appendices A-1-6.2 and A-1-6.3 and Section 6.3.3.3, metals (e.g., mercury) are "major contributors of risk" to the gull and the heron, and metals do not fit such a narcosis model.*

Response 12. The ERA has concluded that, based on TRV-HQs, the target avian predators are not at risk to shipyard-related CoCs (including Hg). The quoted text could not be found in the report; what source is being quoted here? Metals do indeed fit the narcosis model. McCarty and Mackay (1993) state "Although the primary focus of this paper is organic chemicals, the same basic toxicological principles apply to metalloids, organometals and metals" . The relevance of narcosis theory to the various CoC classes considered in the analysis will be stated in the introductory text of Section 6.2.2.2.

McCarty, L.S. and D. Mackay, 1993. Enhancing ecotoxicological modeling and assessment. Environ. Sci. Technol. 27(9):1719-1728.

Comment 13. *[p. 6-45, §6.6, Table 6.6-3] Refer to minutes from the last meeting of the NETC EAB regarding the setting of risk categories such as in this section (e.g., de minimis, etc.). Suter et al. (1995) was rejected by EPA at this meeting (see also pp. 1-28 & 1-29, §1.6, ¶¶1&3). EPA also expressed the need for data reduction or results interpretation using the "+" approach. Review the minutes to this meeting and revise the report accordingly.*

Revise the manner in which risks are reduced in the risk assessment. The current overall risk ranking of stations in Table 6.6-3 does not correspond to the reader's perception of risk based on the actual exposure and effects data (prior to data reduction to "-" or "+" symbols).

Response 13. Risk rankings will be recoded in the report (including Table 6.6-3) as per the EAB meeting agreement; please refer to Comment/

Response 2. If after the revision of risk rankings the EPA still feels there is an outstanding issue regarding the "perception of risk" in Table 6.6-3, the Navy would request that EPA explicitly identify the specific areas of disagreement so that they can be addressed directly.

Comment 14. *[pp. 7-1 to 7-5, §7.1] Review minutes of the last EAB meeting and aforementioned comments for pp. 1-28 & 1-29, §1.6, ¶¶1&3 and p. 6-45, §6.6, Table 6.6-3.*

Response 14. Agreements from the eighth EAB meeting will be taken into consideration and the report will be adjusted accordingly. Please refer to the responses provided to Comment Responses 2 and 13.

Comment 15. *[pp. 8-1 to 8-24, §8.0] Add references for Page and Widdows (1991) and Hoke et al. (1994), which are cited in Table 6.2-3.*

Response 15. These references will be added to Section 8.0.

Comment 16. *[Appendix A-2] The table is missing. Include these data in the revised version of the document.*

Response 16. There is no Appendix Table A-2. "A-2" simply refers to the section of the Appendix which presents Hazard Quotient/Tissue Concentration Ratios Calculations. Notice that there is no Appendix Table A-1.

Comment 17A. *[Appendices A-2-2.1 to A-2-2.5] Revise these tables by including the equations that were used to generate the ratios. To improve the clarity of data, either summarize these data and their meaning, or add a parameter such as "percentage of reference," etc., to help interpret their meaning. Define in the footnotes which reference station(s) the data was obtained from.*

Response 17A. Data in Appendix Tables A-2-2.1 to A-2-2.5 already correspond to percents of the reference value, expressed as a decimal fraction (e.g. %/100). A footnote including the calculation equation, the source of reference data, and the units of the data (% of reference, expressed as a decimal fraction) will be added to improve clarity.

Comment 17B. *It is assumed that the purpose of the data is to provide a measure of relative risk, therefore, this data should be developed in this appendix/tables to add clarity to the previous risk estimates and permit the reader to "cross check" results with the risk data. For example, hazard quotients in Appendices A-1-6.2. and 6.3 indicate that arsenic, mercury, and zinc are major contributors of risk to the gull or heron owing to consumption of prey, with the addition of silver and possibly copper for lobster. Explain what might be a "background" contribution to this estimated risk by developing the reference location data (presumably outside the influence of the site) further and with greater clarity.*

Response 17B. Data in Appendix Tables A-2-2.1 to A-2-2.5 are presently expressed as a percentage of reference, hence it is not possible to further develop the data relative to "background". However, for data in Appendix Tables A1-6.2 and A1-6.3, the Navy proposes to separately calculate mean and maxima for site and reference value results so as to allow the reader to better assess background contributions to risk.

Comment 18. *[Appendices A-2-3.1 & 2-2-3.2] Define Station JPC-1 as a reference station in the footnotes to these tables.*

Response 18. The following footnote will be added to Appendix Tables A-2-3.1 and A-2-3.2: "JPC = Jamestown Potter Cove reference station".